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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/542,208	04/18/2006	Massimo Buscema	084637-011200	1738

32361 7590 04/09/2008
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EXAMINER

COUGHLAN, PETER D

ART UNIT	PAPER NUMBER
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2129

NOTIFICATION DATE	DELIVERY MODE
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04/09/2008

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/542,208	Applicant(s) BUSCEMA, MASSIMO	
	Examiner PETER COUGHLAN	Art Unit 2129	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 January 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Detailed Action

1. This office action is in response to an AMENDMENT entered January 23, 2008 for the patent application 10/10542208 filed on July 14, 2005.
2. All previous office actions are fully incorporated into this Final Office Action by reference.

Status of Claims

3. Claims 1, 3-35 are pending.

Specification Objection

4. Per the MPEP section 608.01(p), essential material may be incorporated by reference if the reference is a U. S. Patent or a U. S. Patent Publication.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

The term "pseudorandom" in claims, 1 and 33 is a relative term which renders the claim indefinite. The term "pseudorandom" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Although, the term itself is mentioned within the specification, there lacks an algorithm, method or guidelines which instruct how to generate 'pseudorandom.'

These claims must be amended or withdrawn from consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-9, 11-13, 23-25, 30-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Buscema in view of Feldgajer. ('Scientific Background of Dynamic

Adaptive Systems, referred to as **Buscema**; U. S. Patent 5832466, referred to as **Feldgajer**)

Claim 1

Buscema teaches defining a set of one or more distributions of the database records onto respective training and testing subsets (**Buscema**, p2, c2:16-34; 'Training subset' of applicant is equivalent to 'training set' of Buscema. 'Testing subset' of applicant is equivalent to 'testing set' of Buscema.); using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each, each of said prediction algorithms being associated with a certain distribution of said database records. (**Buscema**, p3, C2:11-223; 'Train' of applicant is equivalent to 'training the ANN' of Buscema. 'Test' of applicant is equivalent to 'evaluating' of Buscema.)

Buscema does not teach feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated selecting a prediction algorithm having a best fitness score.

Feldgajer teaches feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each (**Feldgajer**, abstract, C4:43-64; 'Feeding the set of prediction algorithms to an evolutionary algorithm' of applicant is equivalent to 'using genetic algorithms' which generate 'parameter values preferably define a first broad range of values' of Feldgajer. 'Fitness score' of applicant is illustrates by finding output with the 'best fit' of Feldgajer.); continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs (**Feldgajer**, abstract, C4:43-64; 'Continuing to feed each generational set of prediction algorithms' of applicant is disclosed by 'new parameters values are assigned to the plurality of groups' of Feldgajer.) where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value(**Feldgajer**, C2:1-26; 'Exceeding a defined minimum' of applicant is disclosed by the neuron and its 'internal potential limit' of Feldgajer. This node can be viewed as the output node of the neural network. The node will fire if the .minimum value' is equaled or exceeded.), the maximum fitness score of successive generational sets of prediction algorithms converging to a given value (**Feldgajer**, C5:63-64; 'Converging to a given value' of applicant is illustrated by the method of employing 'a convergent result.' Of Feldgajer.) , and a certain number of generations having been generated (**Feldgajer**, C7:50 through C8:17; 'Certain number of generations' of applicant is equivalent to generation counter' of Feldgajer.) selecting a prediction algorithm having a best fitness score. (**Feldgajer**, C4:43-64; 'Fitness score' of applicant is illustrates by finding output

with the 'best fit' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using the iterations of a genetic algorithm to modify the neural networks as taught by Feldgajer to feed the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated selecting a prediction algorithm having a best fitness score.

For the purpose of speeding up the training time, thus reducing the cost.

Buscema teaches using the distribution of database records associated with said selected prediction algorithm in performing supervised learning, said supervised learning including training and testing of prediction algorithms to obtain a trained prediction algorithm. (**Buscema**, p4, Figure 4; 'Using the distribution of database records' of applicant is equivalent to 'Total DB' of Buscema.)

Buscema does not teach wherein said method is performed using a computer and computer software forming an intelligent system.

Feldgajer teaches wherein said method is performed using a computer and computer software forming an intelligent system. (**Feldgajer**, C4:43-64; 'Computer and

computer software' of applicant is equivalent to 'computer' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a computer as taught by Feldgajer to wherein said method is performed using a computer and computer software forming an intelligent system.

For the purpose of implementing the invention on current hardware for ease of implementation.

Buscema teaches the trained prediction algorithm is effective to predict output variables for data relating to said condition, thereby predicting diagnosis of said condition. (**Buscema**, p2:16-34)

Buscema teaches generating a population of prediction algorithms, where each one of said prediction algorithms is trained and tested according to a different distribution of the records of the data set in the complete database onto a training data set and a testing data set. (**Buscema**, p4 Figure 4; 'population of prediction algorithms' of applicant is illustrated by ANN1 through ANNn of Buscema.)

Buscema does not teach each different distribution being created as one of a random distribution and a distribution formed by a deterministic mathematical process characterized as a pseudorandom distribution.

Feldgajer teaches each different distribution being created as one of a random distribution and a distribution formed by a deterministic mathematical process characterized as a pseudorandom distribution. (**Feldgajer**, C7:50 through C8:17; 'Random' of applicant is equivalent to 'random' of Feldgajer. 'Pseudorandom' of

applicant is equivalent to 'pseudorandom' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using random and pseudorandom distributions as taught by Feldgajer to each different distribution being created as one of a random distribution and a distribution formed by a deterministic mathematical process characterized as a pseudorandom distribution.

For the purpose of getting a true sample for training purposes

Buscema teaches each prediction algorithm of the said population is trained according to its own distribution of records of the training set and is validated in a blind way according its own distribution on the testing set. (**Buscema**, p4 Figure 4; 'Trained according to its own distribution' and 'validated in a blind way according its own distribution' of applicant is illustrated in the 'training side' and 'validation side' of each ANN of Buscema.)

Buscema does not teach a score reached by each prediction algorithm is calculated in the testing phase representing its fitness an evolutionary algorithm being.

Feldgajer teaches a score reached by each prediction algorithm is calculated in the testing phase representing its fitness (**Feldgajer**, C4:43-64; If Feldgajer can determine which parameter is the 'best fit' then a 'score' must be generated.) an evolutionary algorithm being. (**Feldgajer**, abstract; 'Evolution algorithm' of applicant is equivalent to 'genetic algorithm' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a score to rate performance as taught by Feldgajer to have a

score reached by each prediction algorithm is calculated in the testing phase representing its fitness an evolutionary algorithm being.

For the purpose of using the score for future selection.

Buscema teaches further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm.

(**Buscema**, p4 Figure 4; 'Training set' and 'testing set' of applicant are equivalent to 'training' and 'validation' of Buscema.)

Buscema does not teach the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm.

Feldgajer teaches the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing

data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets (**Feldgajer**, C4:43-64; If Feldgajer can determine which parameter is the 'best fit' then a 'score' must be generated.) repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value (**Feldgajer**, C7:50 through C8:17; 'Repeating the evolution' of applicant is equivalent to 'performed iteratively' of Feldgajer.) setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm. (**Feldgajer**, p7:50 through C8:17; 'Setting the data records' of applicant is equivalent to 'altering the population or the parameter values' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by iterating the process between the genetic algorithm and neural networks to modify the neural network as taught by Feldgajer to have fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a

desired value setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm.

For the purpose of lowering the cost of training the neural network.

Claim 3.

Buscema teaches that to each record of the data set a distribution variable is associated which is binary and has at least two status, one of this two status being associated with the inclusion of the record in the training set and the other in the testing set. (**Buscema**, p2, c2:16-34; 'Training subset' of applicant is equivalent to 'training set' of Buscema. 'Testing subset' of applicant is equivalent to 'testing set' of Buscema.)

Claim 4

Buscema teaches the prediction algorithm is an artificial neural network.
(**Buscema**, p4 Figure 4; 'ANN' of applicant is an 'artificial neural network' of Buscema.)

Claim 5

Buscema teaches the prediction algorithm is a classification algorithm.
(**Buscema**, p4 Figure 4; 'ANN' of applicant is a 'classification algorithm' of Buscema.)

Claim 6

Buscema does not teach that once an optimum distribution has been computed, the optimised training data subset is made equal to a complete data set being the

individuals included in the training subset distributed onto a new training set and onto a new testing set each one having about the half of the records of the original optimized training set, while the originally optimized testing set is used as a third data subset for validation purposes.

Feldgajer teaches that once an optimum distribution has been computed, the optimised training data subset is made equal to a complete data set being the individuals included in the training subset distributed onto a new training set and onto a new testing set each one having about the half of the records of the original optimized training set, while the originally optimized testing set is used as a third data subset for validation purposes. (**Feldgajer**, C4:43-64; 'Training subset distributed onto a new training set' of applicant is disclosed by the generation of a 'second range of values' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by altering the training set as taught by Feldgajer to have that once an optimum distribution has been computed, the optimised training data subset is made equal to a complete data set being the individuals included in the training subset distributed onto a new training set and onto a new testing set each one having about the half of the records of the original optimized training set, while the originally optimized testing set is used as a third data subset for validation purposes.

For the purpose of improving the training time.

Claim 7

Buscema does not teach in that the distribution of the data of the originally optimized training set onto the new training and new testing set is optimized by means of a pre-processing phase.

Feldgajer teaches in that the distribution of the data of the originally optimized training set onto the new training and new testing set is optimized by means of a pre-processing phase. (**Feldgajer**, 'Preprocessing phase' of applicant is the 'genetic algorithm' of Feldgajer.) including the steps of said method for optimizing a database of sample records, said records being records in the originally optimized training set (**Feldgajer**, C10:16-26; 'Optimizing a database' of applicant is equivalent to 'method using groups' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by having an algorithm which provides a pre-processing function as taught by Feldgajer to have the distribution of the data of the originally optimized training set onto the new training and new testing set is optimized by means of a pre-processing phase.

For the purpose of resulting in a preprocessed distribution of data.

Claim 8

Buscema teaches in which the different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database data base comprising a

certain number of known input variables and a certain number of known output variables. (**Buscema**, p4 Figure 4; 'Different choices of structures' of applicant is equivalent to all of the different neural networks, ANN1 through ANNn of Buscema.)

Claim 9

Buscema teaches defining a distribution of data from the complete data set onto a training data set and onto a testing data set (**Buscema**, p2, c2:16-34; 'Training subset' of applicant is equivalent to 'training set' of Buscema. 'Testing subset' of applicant is equivalent to 'testing set' of Buscema.); generating a population of different prediction algorithm each one having a training and/or testing data set in which only some variables have been considered among all the original variables provided in the data sets, each one of the prediction algorithms being generated by means of a different selection of variables (**Buscema**, p4 Figure 4; 'Generating a population of different prediction algorithm' of applicant is equivalent to all of the different neural networks, ANN1 through ANNn of Buscema.) carrying out learning and testing of each prediction algorithm of the population and evaluating the fitness score of each prediction algorithm. (**Buscema**, p4 Figure 4; 'Learning' of applicant is equivalent to 'training' of Buscema. 'Evaluation' of applicant is equivalent to 'validation' of Buscema.)

Buscema does not teach applying an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm for each generation of new prediction algorithms representing each one a new different

selection of input variable, the best prediction algorithm according to the best hypothesis of input variables selection is tested or validated a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performances and the minimum input variables are promoted for the processing of the new generations.

Feldgajer teaches applying an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm (**Feldgajer**, C6:1-4; 'Applying an evolution algorithm' of applicant is equivalent to using a genetic algorithm to evolve the learning parameters of the neural network.) for each generation of new prediction algorithms representing each one a new different selection of input variable, the best prediction algorithm according to the best hypothesis of input variables selection is tested or validated (**Feldgajer**, Fig 4; 'New different selection of input variable' of applicant is equivalent to 'modify population of individual neural networks' of Feldgajer.) a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performances and the minimum input variables are promoted for the processing of the new generations. (**Feldgajer**, C4:43-64; 'Fitness score' of applicant is illustrates by finding output with the 'best fit' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a genetic algorithm to generate values as taught by Feldgajer to an evolutionary algorithm to the population of prediction algorithms for achieving new generations of prediction algorithm for each generation of new prediction

algorithms representing each one a new different selection of input variable, the best prediction algorithm according to the best hypothesis of input variables selection is tested or validated a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performances and the minimum input variables are promoted for the processing of the new generations. For the purpose of employing these values to alter a neural network.

Claim 11

Buscema does not teach in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables, and further comprising a pre-processing phase, including the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables, characterized in that the database subjected to the a pre-processing phase of input variable selection is a training subset and a testing subset processed with said method.

Feldgajer teaches in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the

number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables (**Feldgajer**, C7:34 through C8:17; 'Minimum number of selected input variables' of applicant is illustrated by a genetic algorithm is used to 'reduce the amount of information required to generate an adequate result' of Feldgajer.), and further comprising a pre-processing phase, including the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables, characterized in that the database subjected to the a pre-processing phase of input variable selection is a training subset and a testing subset processed with said method. (**Feldgajer**, C10:16-26; 'Optimization of the distribution' of applicant is equivalent to 'method using groups' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by reducing the number of variables if possible as taught by Feldgajer to have different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database, which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables, and further comprising a pre-processing phase, including the steps of said method for optimizing a database of

sample records, for selecting the most predictive input variables, characterized in that the database subjected to the a pre-processing phase of input variable selection is a training subset and a testing subset processed with said method.

For the purpose of increasing the speed by removing some of the input variables of the neural network.

Claim 12

Buscema does not teach in that the complete database the distribution of the records of which has to be optimized has data records having a selected number of input variables, the selection being carried out with said method, and in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database. Which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables.

Feldgajer teaches in that the complete database the distribution of the records of which has to be optimized has data records having a selected number of input variables, the selection being carried out with said method, and in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database. Which selections consist in leaving out at least one, preferably two or more

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variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables. (**Feldgajer**, C7:34 through C8:17; 'Minimum number of selected input variables' of applicant is illustrated by a genetic algorithm is used to 'reduce the amount of information required to generate an adequate result' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by reducing the number of input parameters as taught by Feldgajer to have that the complete database the distribution of the records of which has to be optimized has data records having a selected number of input variables, the selection being carried out with said method, and in which different choices of the structure of the training subset and the structure of the testing subset consist in different selections of the number of input variables of the data records of the database. Which selections consist in leaving out at least one, preferably two or more variables from the entire input variable set forming each record, the records of the database comprising a certain number of known input variables and a certain number of known output variables.

For the purpose of increasing the speed by removing some of the input variables of the neural network.

Claim 13

Buscema does not teach the pre-processing phases for optimizing the distribution of the records on a training subset and a testing subset and for selecting the

most predictive input variables, is carried out alternatively one to the other several times.

Feldgajer teaches the pre-processing phases for optimizing the distribution of the records on a training subset and a testing subset and for selecting the most predictive input variables, is carried out alternatively one to the other several times. (**Feldgajer**, C10:16-26; 'Optimization of the distribution' of applicant is equivalent to 'method using groups' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by optimization the distribution as taught by Feldgajer to have the pre-processing phases for optimizing the distribution of the records on a training subset and a testing subset and for selecting the most predictive input variables, is carried out alternatively one to the other several times.

For the purpose of using existing distribution data as efficiently as possible.

Claim 23

Buscema does not teach characterized in that it is in the form of a software program comprising instructions executable by a CPU, the software program being stored in a memory to which the CPU can access.

Feldgajer teaches characterized in that it is in the form of a software program comprising instructions executable by a CPU, the software program being stored in a memory to which the CPU can access. (**Feldgajer**, C4:43-64; 'Instructions executable by a CPU, the software program being stored in a memory to which the CPU can

access' of applicant are all common functions of a 'computer' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by implementing the invention on a computer as taught by Feldgajer to have a software program comprising instructions executable by a CPU, the software program being stored in a memory to which the CPU can access.

For the purpose of implementing the invention on a common device to encourage its use.

Claim 24

Buscema does not teach a software program stored on a memory device, the said software program consisting in the method according to claim 1 in the form of an executable instructions of a CPU or of a computer system.

Feldgajer teaches a software program stored on a memory device, the said software program consisting in the method according to claim 1 in the form of a executable instructions of a CPU or of a computer system. (**Feldgajer**, C4:43-64; 'Software program stored on a memory device, the said software program consisting in the method according to claim 1 in the form of a executable instructions of a CPU or of a computer system' of applicant are all common functions of a 'computer' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using standard memory with the invention as taught by Feldgajer to have a software program stored on

a memory device, the said software program consisting in the method according to claim 1 in the form of a executable instructions of a CPU or of a computer system.

For the purpose of implementing the invention on a common device to encourage its use.

Claim 25

Buscema teaches an apparatus or device for generating an action of response which is autonomously, i.e. by itself. (**Buscema**, p4, Figure 4; The contents of the ANN supervised validation protocol is a stand alone design.) chosen among a certain number of different kinds of actions of response stored in a memory of the apparatus or autonomously generated by the apparatus basing the said choice of the kind of action of response on the interpretation of data collected autonomously by means of one or more sensors responsive to physical entities or which are fed to the apparatus by means of input means. (**Buscema**, p4, Figure 4, Examples of 'actions and responses' of applicant is equivalent to 'the benign and malignant tumors and their characteristics of Buscema.)

Buscema does not teach the said interpretation being made by means of a prediction algorithm in the form of a software saved in a memory of the said apparatus and being carried out by a central processing unit.

Feldgajer teaches the said interpretation being made by means of a prediction algorithm in the form of a software saved in a memory of the said apparatus and being carried out by a central processing unit. (**Feldgajer**, C4:43-64; 'Central processing unit' of applicant is an element of a 'computer' of Feldgajer.) It would have been obvious to a

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person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using standard computer operations as taught by Feldgajer to have the said interpretation being made by means of a prediction algorithm in the form of a software saved in a memory of the said apparatus and being carried out by a central processing unit.

For the purpose of implementing the invention on a computer with normal operating characteristics

Buscema teaches characterized in that the apparatus being further provided with means for carrying out a training and testing phase of the prediction algorithm by inputting to the said prediction algorithm data of a known database in which input variables of the input data representing the physical entities able to being sensed by the apparatus through the one or more sensors and/or able to be fed to the apparatus by means of the input means are univoquely correlated to at least one definite kind of action of response among the different kinds of possible action of response. (**Buscema**, p4, Figure 4; 'Training and testing' of applicant is equivalent to 'testing' and 'validation' of Buscema.)

Buscema does not teach the said means for carrying out the training an testing being in the form of a training and testing software saved in a memory of the apparatus, the said training and testing being carried out by means of a method according to claim 1, the said training and testing software program being the said method of training and testing in the form of a software program or instructions.

Feldgajer teaches the said means for carrying out the training and testing being in the form of a training and testing software saved in a memory of the apparatus, the said training and testing being carried out by means of a method according to claim 1, the said training and testing software program being the said method of training and testing in the form of a software program or instructions. (**Feldgajer**, C4:43-64; 'Carrying out the training and testing' using 'memory' of applicant are all normal operations of a 'computer' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using memory to hold testing and training software as taught by Feldgajer to have a means for carrying out the training and testing being in the form of a training and testing software saved in a memory of the apparatus, the said training and testing being carried out by means of a method according to claim 1, the said training and testing software program being the said method of training and testing in the form of a software program or instructions.

For the purpose of implementing the invention in a normal established method.

Claim 30

Buscema teaches for producing a microarray for genotyping operations (**Buscema**, p4, Figure 4; 'Microarray for genotyping operations' of applicant is equivalent to all the ANN 1 through n of Buscema.), the said method comprising the steps of defining a certain number of theoretically relevant genes or alleles or polymorphisms considered relevant for a certain biologic condition like a tissue

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structure, a pathology or the potentiality of developing a pathology or an anatomic or morphologic feature. (**Buscema**, p2:16-39; 'Relevant for a certain biologic condition' of applicant is disclosed by classifying new cases for tumors of Buscema.); a) providing a database of experimentally determined data in which each record relates to a known clinical or experimental case of a sample population of cases and which records comprise a certain number of input variables corresponding to the presence/absence of a certain predetermined number of polymorphisms and/or mutations and/or equivalent genes of a certain number of theoretically probable relevant genes, said certain predetermined number of polymorphisms and/or genes forming a set, and one or more related output variables corresponding to the certain biological or pathologic condition of the said clinical and experimental cases of the sample population (**Buscema**, p4, Figure 4; 'Database of experimentally determined data' of applicant is equivalent to 'Total DB' of Buscema.) characterized by the following further steps: determining a selection of a subset of the set of certain predetermined number of polymorphisms and/or genes by testing the association of the said genes or polymorphisms and the biological or pathological condition by means of mathematical tools applied to the database (**Buscema**, p4, Figure 4; One example of a tool is a artificial neural network' of Buscema.); the said mathematical tools comprise a so called prediction algorithm such as a so called neural network (**Buscema**, p4, Figure 4; One example of a tool is a artificial neural network' of Buscema.); and the further steps are carried out of: dividing the database into a training and a testing dataset for training and testing the prediction

algorithm. (**Buscema**, p4, Figure 4; Buscema discloses the database being divided into training and testing sets.)

Buscema does not teach defining two or more different training datasets each one having records with a set of input variables obtained by excluding one or more input variables from the originally defined number of input variables. while for each record the set of input variables of the corresponding training set has at least one input variable which is not a member of the set of input variables of the other training datasets, each said at least one input variable consisting in a different gene or a different polymorphisms and/or a different mutation and/or a different functionally equivalent gene thereof of the originally considered genes or polymorphisms and/or mutations and/or functionally equivalent genes thereof considered theoretically potentially relevant for the biologic or pathologic condition training the prediction algorithm with each of the different training sets defined under point e) for generating a first population of different prediction algorithm which are divided into two groups of mother and father prediction algorithms and testing the said prediction algorithms with the associated testing set calculating a fitness score or prediction accuracy of each father and mother prediction algorithms of the said first population by means of the testing results; providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable selections of the records of the training and of the testing datasets of the first or

previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm for each generation of new prediction algorithms representing each new variant selection of input variables, the best prediction algorithm according to the best hypothesis of input variable selection is tested or validated by means of the testing dataset; a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performance with the minimum number of input variables utilized are promoted for the processing of new generations; repeating the steps i) to k) until a predetermined fitness score defined as best fit of the prediction algorithm and a minimum number of input variables has been reached; m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables.

Feldgajer teaches defining two or more different training datasets each one having records with a set of input variables obtained by excluding one or more input variables from the originally defined number of input variables. while for each record the set of input variables of the corresponding training set has at least one input variable which is not a member of the set of input variables of the other training datasets, each said at least one input variable consisting in a different gene or a different polymorphisms and/or a different mutation and/or a different functionally equivalent gene thereof of the originally considered genes or polymorphisms and/or mutations

and/or functionally equivalent genes thereof considered theoretically potentially relevant for the biologic or pathologic condition(**Feldgajer**, C3:62 through C4:30; 'A different gene or a different polymorphisms and/or a different mutation and/or a different functionally equivalent gene thereof of the originally considered genes or polymorphisms and/or mutations and/or functionally equivalent genes' of applicant is equivalent to genetic algorithms which the basic properties are 'mutation, evaluation and selection' of Feldgajer.) training the prediction algorithm with each of the different training sets defined under point e) for generating a first population of different prediction algorithm which are divided into two groups of mother and father prediction algorithms and testing the said prediction algorithms with the associated testing set (**Feldgajer**, C3:62 through C4:30; 'Mother' and 'Father' of applicant would be used in the 'crossover' portion of genetic algorithms of Feldgajer.) calculating a fitness score or prediction accuracy of each father and mother prediction algorithms of the said first population by means of the testing results (**Feldgajer**, C3:62 through C4:30; 'Calculating a fitness score or prediction accuracy' of applicant is equivalent to 'evaluation' of Feldgajer.); providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable selections of the records of the training and of the testing datasets of the first or previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm (**Feldgajer**, C3:62

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through C4:30; "Genetic algorithm" of applicant is equivalent to 'genetic algorithm' of Feldgajer.) for each generation of new prediction algorithms representing each new variant selection of input variables, the best prediction algorithm according to the best hypothesis of input variable selection is tested or validated by means of the testing dataset (**Feldgajer**, C3:62 through C4:64; 'Each generation of new prediction algorithms representing each new variant selection' of applicant is equivalent to 'new parameter values are assigned to the plurality of groups' of Feldgajer.); a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performance with the minimum number of input variables utilized are promoted for the processing of new generations (**Feldgajer**, C3:62 through C4:64; 'Fitness score is evaluated' of applicant is illustrated by finding the 'best fit' based on the 'parameter value' of Feldgajer.); repeating the steps i) to k) until a predetermined fitness score defined as best fit of the prediction algorithm and a minimum number of input variables has been reached (**Feldgajer**, C7:50 through C8:17; 'Repeating the steps' of applicant is equivalent to 'the method is performed iteratively' of Feldgajer.); m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables. (**Feldgajer**, C7:34 through C8:17; 'Minimum number of selected input variables' of applicant is illustrated by a genetic algorithm is used to 'reduce the amount of information required to generate an adequate result' of Feldgajer.) It would have been

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obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a training set and a testing set and incorporating a genetic algorithm to alter the weights of a neural network as taught by Feldgajer by defining two or more different training datasets each one having records with a set of input variables obtained by excluding one or more input variables from the originally defined number of input variables. while for each record the set of input variables of the corresponding training set has at least one input variable which is not a member of the set of input variables of the other training datasets, each said at least one input variable consisting in a different gene or a different polymorphisms and/or a different mutation and/or a different functionally equivalent gene thereof of the originally considered genes or polymorphisms and/or mutations and/or functionally equivalent genes thereof considered theoretically potentially relevant for the biologic or pathologic condition training the prediction algorithm with each of the different training sets defined under point e) for generating a first population of different prediction algorithm which are divided into two groups of mother and father prediction algorithms and testing the said prediction algorithms with the associated testing set calculating a fitness score or prediction accuracy of each father and mother prediction algorithms of the said first population by means of the testing results; providing a so called evolutionary algorithm such a genetic algorithm and applying the evolutionary algorithm to the first population of mother and father prediction algorithms for achieving new generation of prediction algorithms whose training and testing dataset comprises records whose input variables selections are a combination of the input variable selections of the records of the

training and of the testing datasets of the first or previous population of father and mother prediction algorithms according to the rules of the evolutionary algorithm for each generation of new prediction algorithms representing each new variant selection of input variables, the best prediction algorithm according to the best hypothesis of input variable selection is tested or validated by means of the testing dataset; a fitness score is evaluated and the prediction algorithms representing the selections of input variables which have the best testing performance with the minimum number of input variables utilized are promoted for the processing of new generations; repeating the steps i) to k) until a predetermined fitness score defined as best fit of the prediction algorithm and a minimum number of input variables has been reached; m) defining as the selected relevant input variables i.e. as the relevant genes or polymorphisms and/or of mutations and/or of functionally equivalent genes thereof the ones related to the input variables of the selection represented by the prediction algorithm having both at least the predetermined fitness score and also the minimum number of selected input variables.

For the purpose of using the genetic algorithm to decrease the training time and with the possibility of reducing input parameters.

Claim 31

Buscema does not teach an optimization of the distribution of the records of the original database in a training dataset and in a testing dataset is carried out in one of a pre processing and a post processing phase, i.e. before carrying out the steps e) to m) at step d) or after having carried out the steps a) to m)

Feldgajer teaches an optimization of the distribution of the records of the original database in a training dataset and in a testing dataset is carried out in one of a pre processing and a post processing phase, i.e. before carrying out the steps e) to m) at step d) or after having carried out the steps a) to m) (**Feldgajer**, C10:16-26; 'Optimization of the distribution' of applicant is equivalent to 'method using groups' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by optimizing the distribution of records as taught by Feldgajer to have an optimization of the distribution of the records of the original database in a training dataset and in a testing dataset is carried out in one of a pre processing and a post processing phase, i.e. before carrying out the steps e) to m) at step d) or after having carried out the steps a) to m)

For the purpose of getting a true random sample to reduce training costs.

Claim 32

Buscema teaches defining a set of one or more distributions of the database records onto respective training and testing subsets (**Buscema**, p2, c2:16-34, p4 Figure 4; 'Training subset' of applicant is equivalent to 'training set' of Buscema. 'Testing subset' of applicant is equivalent to 'testing set' of Buscema.); using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each. (**Buscema**, p4 Figure 4; 'defined set of distributions' of applicant is illustrated in the 'training side' and 'validation side' of each ANN of Buscema.)

Buscema does not teach feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; and continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs where said termination event is at least one of a prediction algorithm is generated with a fitness score equaling or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated.

Feldgajer teaches feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each (**Feldgajer**, C4:43-64; 'generates a set of one or more second generation prediction algorithms' of applicant is disclosed by the 'new parameter values are assigned to the plurality of groups' of Feldgajer.); and continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs (**Feldgajer**, C3:62 through C4:28; 'Termination' of applicant is equivalent to 'termination condition' of Feldgajer.) where said termination event is at least one of a prediction algorithm is generated with a fitness score equaling or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated. (**Feldgajer**, C2:1-26, C5:63-64, C7:50 through C8:17; 'Exceeding a defined minimum' of applicant is disclosed by the neuron and its 'internal potential limit' of Feldgajer. This node can be viewed as the output node of the neural network. The node

will fire if the .minimum value' is equaled or exceeded. 'Converging to a given value' of applicant is illustrated by the method of employing 'a convergent result.' Of Feldgajer. 'Certain number of generations' of applicant is equivalent to generation counter' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a genetic algorithm to alter the weights of a neural network as taught by Feldgajer to have the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; and continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs where said termination event is at least one of a prediction algorithm is generated with a fitness score equaling or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated.

For the purpose of using the genetic algorithm to decrease the training time and with the possibility of reducing input parameters.

Claim 33

Buscema teaches generating a population of prediction algorithm each one of them is trained and tested according to a different distribution of the records of the data set in the complete database onto a training data set and a testing data set. (**Buscema**, p2, c2:16-34, p4 Figure 4; 'Training subset' of applicant is equivalent to 'training set' of Buscema.

'Testing subset' of applicant is equivalent to 'testing set' of Buscema. 'Population of prediction algorithm' of applicant is equivalent to 'ANN1 through ANN n' of Buscema.)

Buscema does not teach each different distribution being created by a random or pseudo-random distribution.

Feldgajer teaches each different distribution being created by a random distribution or a distribution formed by a deterministic mathematical process characterized as a pseudo-random distribution. (**Feldgajer**, p7:50 through C8:17; 'Random or pseudo-random' of applicant is equivalent to 'random or pseudo-random' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using random or pseudo random techniques as taught by Feldgajer to have a different distribution being created by a random distribution or a distribution formed by a deterministic mathematical process characterized as a pseudo-random distribution

For the purpose of using another method for finding a true random sample.

Buscema teaches each prediction algorithm of the said population is trained according to its own distribution of records of the training set and is validated in a blind way according its own distribution on the testing set. (**Buscema**, p4 Figure 4; 'Trained according to its own distribution' and 'validated in a blind way according its own distribution' of applicant is illustrated in the 'training side' and 'validation side' of each ANN of Buscema.)

Buscema does not teach a score reached by each prediction algorithm is calculated in the testing phase representing its fitness; - an evolutionary algorithm being

further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm.

Feldgajer teaches a score reached by each prediction algorithm is calculated in the testing phase representing its fitness; - an evolutionary algorithm being further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm (**Feldgajer**, p4:43-64; 'A score is reached by each prediction algorithm' of applicant by being able to determine which set of parameters provides the

'best fit' of Feldgajer.) the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets (**Feldgajer**, p4:43-64; 'A fitness score of each prediction algorithm' of applicant by being able to determine which set of parameters provides the 'best fit' of Feldgajer.) repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value (**Feldgajer**, p7:50 through C8:17; 'Repeating the evolution' of applicant is equivalent to 'the method is performed iteratively' of Feldgajer.) setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm. (**Feldgajer**, p7:50 through C8:17; 'Setting the data records' of applicant is equivalent to 'altering the population or the parameter values' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using fitness scores to determine the standing of a neural network and it's associated values from the genetic algorithm as taught by Feldgajer to have a score reached by each prediction algorithm is calculated in the testing phase representing its fitness; - an evolutionary algorithm being further provided which combines the different models of distribution of the records of the complete data set in a training and in a testing set which sets are represented each one by a corresponding prediction algorithm trained and tested

on the basis of the said training and testing data set according to the fitness score calculated in the previous step for the corresponding prediction algorithm the fitness score of each prediction algorithm corresponding to one of the different distributions of the complete data set on the training and the testing data sets being the probability of evolution of each prediction algorithm or of each said distribution of the complete data set on the training and testing data sets repeating the evolution of the prediction algorithm generation for a finite number of generations or till the output of the genetic algorithm converges to a best solution and/or till the fitness value of at least some prediction algorithm related to an associated data records distribution has reached a desired value setting the data records distribution for the best solution as the optimized training and testing subsets for training and testing prediction algorithm.

For the purpose of being able to find the neural network with the best fit to use as a bases for a following iteration.

Claim 34

Buscema does not teach a reduced number of genes, alleles or polymorphisms characterized in that the reduced number of the said genes, alleles or polymorphisms has been selected by means of a method according to claims 30 to 33.

Feldgajer teaches a reduced number of genes, alleles or polymorphisms characterized in that the reduced number of the said genes, alleles or polymorphisms has been selected by means of a method according to claims 30 to 33. (**Feldgajer**, C7:34 through C8:17; 'Reduced number of genes, alleles or polymorphisms' of applicant is

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illustrated by a genetic algorithm is used to 'reduce the amount of information required to generate an adequate result' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by reducing input values as taught by Feldgajer to have a reduced number of genes, alleles or polymorphisms characterized in that the reduced number of the said genes, alleles or polymorphisms has been selected by means of a method according to claims 30 to 33.

For the purpose of making the neural network more efficient.

Claim 35

Buscema teaches defining a set of one or more distributions of the database records onto respective training and testing subsets. (**Buscema**, p2, c2:16-34; 'Training subset' of applicant is equivalent to 'training set' of Buscema. 'Testing subset' of applicant is equivalent to 'testing set' of Buscema.)

Buscema does not teach using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each, each of said prediction algorithms being associated with a certain distribution of said records; feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs, where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to

or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction algorithms converging to a given value, and a certain number of generations having been generated; selecting a prediction algorithm having a best fitness score.

Feldgajer teaches using the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each, each of said prediction algorithms being associated with a certain distribution of said records (**Feldgajer**, abstract, C4:43-64; 'Set of distributions to train and test a first generation set' of applicant is equivalent to 'using genetic algorithms' which generate 'parameter values preferably define a first broad range of values' of Feldgajer. 'Fitness score' of applicant is illustrated by finding output with the 'best fit' of Feldgajer.); feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each (**Feldgajer**, abstract, C4:43-64; 'Feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms' of applicant is disclosed by 'new parameters values are assigned to the plurality of groups' of Feldgajer.); continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs, where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value (**Feldgajer**, C2:1-26; 'Exceeding a defined minimum' of applicant is disclosed by the neuron and its 'internal potential limit' of Feldgajer. This node can be viewed as the output node of the neural

network. The node will fire if the .minimum value' is equaled or exceeded.), the maximum fitness score of successive generational sets of prediction algorithms converging to a given value (**Feldgajer**, C5:63-64; 'Converging to a given value' of applicant is illustrated by the method of employing 'a convergent result.' Of Feldgajer.), and a certain number of generations having been generated (**Feldgajer**, C7:50 through C8:17; 'Certain number of generations' of applicant is equivalent to generation counter' of Feldgajer.); selecting a prediction algorithm having a best fitness score. (**Feldgajer**, C4:43-64; 'Fitness score' of applicant is illustrates by finding output with the 'best fit' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using initial distributions of data with an neural network which results in fitness scores which are then passed into a genetic algorithm for altering the value to improve the fitness level of the neural networks with the next iteration as taught by Feldgajer to have the defined set of distributions to train and test a first generation set of one or more prediction algorithms and assigning a fitness score to each, each of said prediction algorithms being associated with a certain distribution of said records; feeding the set of prediction algorithms to an evolutionary algorithm which generates a set of one or more second generation prediction algorithms and assigns a fitness score to each; continuing to feed each generational set of prediction algorithms to the evolutionary algorithm until a termination event occurs, where said termination event is at least one of a prediction algorithm is generated with a fitness score equal to or exceeding a defined minimum value, the maximum fitness score of successive generational sets of prediction

algorithms converging to a given value, and a certain number of generations having been generated; selecting a prediction algorithm having a best fitness score.

For the purpose of reducing the cost of the training of the neural network.

Buscema teaches using the distribution of database records associated with said selected prediction algorithm in performing supervised learning, said supervised learning including training and testing of prediction algorithms to obtain a trained prediction algorithm (**Buscema**, p4, Figure 4; 'Using the distribution of database records' of applicant is equivalent to 'Total DB' of Buscema.); and using the trained prediction algorithm to predict the output variables relating to the problem under investigation where only the input variables are known. (**Buscema**, p2:16-39; 'To predict the output variables' of applicant is equivalent to 'classify the new cases' of Buscema.)

Buscema does not teach wherein said method is performed using a computer and computer software forming an intelligent system.

Feldgajer teaches wherein said method is performed using a computer and computer software forming an intelligent system. (**Feldgajer**, C4:43-64; 'Computer and computer software' of applicant is equivalent to 'computer' of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using a computer to implement the invention as taught by Feldgajer to have the method is performed using a computer and computer software forming an intelligent system.

For the purpose of being able to implement the invention with a common machine.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10, 14, 21, 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema and Feldgajer in view of Lapointe. (U. S. Patent Publication 20030004906, referred to as **Lapointe**)

Claim 10

Buscema and Feldgajer do not teach the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables.

Lapointe teaches the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables. (**Lapointe**, ¶0099; 'Optimizing a database' of applicant is achieved by the 'greedy algorithm' of Lapointe.) It

would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by using the best results as taught by Lapointe to have the steps of said method for optimizing a database of sample records, for selecting the most predictive input variables.

For the purpose of starting the next generation based on the most predictive inputs for efficient training.

Claim 14

Buscema and Feldgajer do not teach an average health value of the population is computed as a function of the fitness values of each single individual in the population; coupling, recombination of genes and mutation of genes are carried out in a differentiated manner depending on the a comparison between the fitness of each individual of the couple and the average health value of the entire population to which the individuals belong; individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a vulnerability list; the number of subjects entered in the vulnerability list defining the number of possible marriages.

Lapointe teaches an average health value of the population is computed as a function of the fitness values of each single individual in the population (**Lapointe**, ¶0019; Lapointe invention is in regards to a woman's health.); coupling, recombination of genes and mutation of genes are carried out in a differentiated manner depending on

the a comparison between the fitness of each individual of the couple and the average health value of the entire population to which the individuals belong (**Lapointe**, ¶0013 (for 'differentiated manner') and ¶0137; 'Recombination' and 'mutation' of applicant is equivalent to 'genetic algorithms' of Lapointe.); individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a vulnerability list (**Lapointe**, ¶0430; Since applicant does not exclude the creation that is below a fitness value, this is equivalent to the contingency table of Lapointe. If the information is above a fitness level of applicant then it is on the contingency table of Lapointe. Below a given fitness value would be equivalent to 'vulnerability list.');

the number of subjects entered in the vulnerability list defining the number of possible marriages. (**Lapointe**, ¶0100; Since not all of the population is not involved with marriages then they (vulnerability list) 'defines' the number of possible marriages.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by not using individuals which are below the average as taught by Lapointe to have an average health value of the population is computed as a function of the fitness values of each single individual in the population; coupling, recombination of genes and mutation of genes are carried out in a differentiated manner depending on the a comparison between the fitness of each individual of the couple and the average health value of the entire population to which the individuals belong; individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a

vulnerability list; the number of subjects entered in the vulnerability list defining the number of possible marriages.

For the purpose of using individuals with a promising result to be the bases of the next iteration.

Claim 21

Buscema teaches in which the individuals are the different prediction algorithm representing a corresponding different initial random distribution of data records onto the testing and the training data set and the genes consist in the binary status variable of association of each record to the training and to the testing subset. (**Buscema**, p2, C2:16-34; 'Initial random distribution' of applicant is equivalent to 'random sample' of Buscema.)

Claim 22

Buscema teaches in which the individuals are the prediction algorithms each one representing a different training and testing data set, the difference residing in a different selection of input variables for each different training and testing subset, and the genes consist in the different selection variable which is provided for each input variable in the different training and testing subsets, the above mentioned selection variable being a parameter indicating the presence/absence of each corresponding input variable in the records of each data set. (**Buscema**, p2, C2:16-

34, p4, Figure 4; Buscema discloses different training and validation sets. Figure 4 illustrates both testing and validation have within them 'present/absent' categories.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 15, 16, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema and Feldgajer as set forth above in view of Boden. (U.S. Patent 5708774, referred to as **Boden**)

Claim 15

Buscema and Feldgajer do not teach in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population.

Boden teaches in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population. (**Boden**, C6:6-15; 'Average health value' of applicant is equivalent to 'relative fitness' of Boden. Per Boden individuals with a low fitness value may not be selected. Thus, 'Couples with both members that are below the relative fitness level will not be selected.') It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by having an algorithm for selection as taught by Boden to have in which for coupling purposes and for generation of children at least one parent individuals must have a fitness value greater than the average health value of the population.

For the purpose of not selecting both pairs that are below the average health value.

Claim 16

Buscema and Feldgajer do not teach in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children.

Boden teaches in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage

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occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children. (**Boden**, C6:6-15; If a parent is chosen to have a child then it is due to the fact is a child which has a different fitness value than its parents. If it did not then there would be no improvement within the algorithm.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by choosing one parent above and the second parent below the average health value as taught by Boden to have in that each couple of individuals can generate individuals having a fitness different from the average health, so called offsprings if the fitness of one them, at least is greater than the average fitness, the offsprings of each marriage occupying the places of subjects entered in the vulnerability list and are marked out, so that a weak individual can continue to exist through his own children.

For the purpose of allowing the weaker parent to generate offspring that might be above the average health value.

Claim 17

Buscema and Feldgajer do not teach in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed.

Boden teaches in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed. (**Boden**, C6:6-15; "Low fitness value" are not chosen to have children.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of

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Buscema and Feldgajer by not allowing parents that are below the average health value to generate offspring as taught by Boden to have in that coupling between individuals having a very low fitness value and a very high fitness value are not allowed.

For the purpose of eliminating generations of offspring that will be below the average health value.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 18, 19, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema, Feldgajer and Lapointe as set forth above, in view of Burke and Boden. ('A Genetic Algorithm Tutorial Tool for Numerical Function Optimisation', referred to as **Burke**; U. S. Patent 5708774, referred to as **Boden**)

Claim 18

Buscema, Feldgajer and Lapointe do not teach in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parent's individuals have not common genes.

Burke teaches in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parents individuals have not common genes. (**Burke**, p29, C2:10-20; 'Not have common genes' of applicant is controlled by Burke's 'Incest laws 0-3'.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema, Feldgajer and Lapointe by considering parents with genes not in common as taught by Burke to have in that the following recombination rules of the genes of the parents individuals coupled are considered in the case the parents individuals have not common genes.

For the purpose of starting with a broader domain of genes to avoid a local minimum.

Buscema, Feldgajer do not teach the health of father and mother individuals are greater than the average health of the entire population; the crossover is a classical crossover according to which the genes of the father and of the mother individuals are substituted one with the other starting from a certain crossover point; the health of father and mother individuals are lower than the average health of the entire population; in this case the two children are formed through rejection of the parents genes they will receive by the crossover process.

Lapointe teaches the health of father and mother individuals are greater than the average health of the entire population; the crossover is a classical crossover according to which the genes of the father and of the mother individuals are substituted one with the other starting from a certain crossover point (**Lapointe**, ¶0100); the health of father and mother individuals are lower than the average health of the entire population; in this case the two children are formed through rejection of the parents genes they will receive by the crossover process. (**Lapointe**, ¶0034, 'Through rejection of the parents genes is equivalent to a 'sliding window' or an average of the variable.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by using individuals which are greater than the average as taught by Lapointe to the health of father and mother individuals are greater than the average health of the entire population; the crossover is a classical crossover according to which the genes of the father and of the mother individuals are substituted one with the other starting from a certain crossover point; the health of father and mother individuals are lower than the average health of the entire population; in this case the two children are formed through rejection of the parents genes they will receive by the crossover process.

For the purpose of using crossover with fit parents for better results.

Buscema, Feldgajer and Lapointe do not teach the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit

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their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected.

Boden teaches the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected. (**Boden**, C6:6-15; Rejection of the parent which is below the average of applicant is equivalent to 'low fitness value may not be selected' of Boden.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema, Feldgajer and Lapointe by stating the rule where parents with below average health value will not pass on their genes as taught by Boden to have the health of one of the parents is less than the average health of the entire population while the health of the other parent is greater than the average health of the entire population; in this case only the parents whose health is greater than the average health of the entire population will transmit their genes, while the genes of the parent having an health lower than the average health of the entire population are rejected.

For the purpose of following the general guidelines of a genetic algorithm.

Claim 19

Buscema does not teach wherein each gene is characterised by a status level, the method further characterized in that genes rejection consists in modifying the status of the genes from one status level to a different status level.

Feldgajer teaches wherein each gene is characterised by a status level, the method further characterized in that genes rejection consists in modifying the status of the genes from one status level to a different status level. (**Feldgajer**, C4:28-30; 'Modifying the status' of a gene is accomplished by replacing the worst individuals with the best individuals of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by changing status levels as taught by Feldgajer to have each gene is characterised by a status level, the method further characterized in that genes rejection consists in modifying the status of the genes from one status level to a different status level.

For the purpose of improving the status for improved results with the next iteration.

Claim 20

Buscema does not teach in that a modified crossover of the genes of the parents individuals is carried out when the parents individuals has part of the genes that coincide, this modified crossover provides for generating and offspring in which the genes selected for crossover are the most effective ones of the parents.

Feldgajer teaches in that a modified crossover of the genes of the parents individuals is carried out when the parents individuals has part of the genes that coincide, this modified crossover provides for generating and offspring in which the genes selected for crossover are the most effective ones of the parents. (**Feldgajer**, C3:62 through C4:30; 'Parents' of applicant would be used in the 'crossover' portion of genetic algorithms of Feldgajer.) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema by using better parents, better offspring are created using crossover as taught by Feldgajer to have a modified crossover of the genes of the parents individuals is carried out when the parents individuals has part of the genes that coincide, this modified crossover provides for generating and offspring in which the genes selected for crossover are the most effective ones of the parents.

For the purpose of improving the status for improved results with the next iteration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the

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subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 26, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema and Feldgajer as set forth above in view of Rose. (U. S. Patent Publication 20020178132, referred to as **Rose**)

Claim 26

Buscema and Feldgajer do not teach in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to claim 1, a further or the same above mentioned memory in which a dataset of known data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records.

Rose teaches in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to claim 1, a further or the same above mentioned memory in which a dataset of known

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data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records. (**Rose**, ¶0015) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by having data be related to sound or acoustic waves as taught by Rose to have in that it is a system for sound or vocal recognition comprising input means responsive to acoustic waves, a processing unit connected to the input means responsive to acoustic waves, at least a memory in which a software program is stored the said program being in the form according to claims 23 or 24 and comprising coded instructions for enabling the processing unit to carry out a method according to claim 1, a further or the same above mentioned memory in which a dataset of known data records is stored or can be stored and/or input means for storing in the further or the said above mentioned memory a dataset of known data records.

For the purpose of utilizing the invention within a real world environment.

Claim 28

Buscema and Feldgajer do not teach in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of

objects to which the said acoustic signals or image data are related and/or from which the said acoustic signals or image data are generated.

Rose teaches in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of objects to which the said acoustic signals or image data are related and/or from which the said acoustic signals or image data are generated. (**Rose**, ¶0004) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by using signals to detect living beings as taught by Rose to have in that the database of known data records comprises acoustic signals emitted by one or more objects or one or more living beings making part of the typical environment in which the device has to operate or the data relating to one or more images of one or more objects or one or more living beings making part of the typical environment in which the device has to operate to which are univoquely correlated to corresponding known kind, and/or identity and/or meaning of objects to which the said acoustic signals or image data are related and/or from which the said acoustic signals or image data are generated.

For the purpose of detecting living beings to aid in rendering a decision to an environment.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema and Feldgajer as set forth above in view of Breed. (U. S. Patent Publication 20030002690, referred to as **Breed**)

Claim 27

Buscema and Feldgajer do not teach in that it is a system for image recognition, the input means being responsible to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object.

Breed teaches in that it is a system for image recognition, the input means being responsible to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object. (**Breed**, abstract) It would have been obvious to a person having

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ordinary skill in the art at the time of applicant's invention to modify the combined teachings of Buscema and Feldgajer by using image data in the form of electromagnetic waves as taught by Breed to have in that it is a system for image recognition, the input means being responsive to electromagnetic waves, the system being able to recognize the shape of an object generating or reflecting electromagnetic waves, and/or the distance and/or the identity of the object.

For the purpose of implementing the invention for use for image recognition.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Buscema, Feldgajer and Breed as set forth above in view of Lapointe. (U. S. Patent Publication 20030004906, referred to as **Lapointe**)

Claim 29

Buscema, Feldgajer and Breed do not teach a specialized system for image pattern recognition having artificial intelligence utilities for analyzing a digitalized image, i.e. an image in the form of a array of image data records, each image data record being related to a zone or point or unitary area or volume of a two or three dimensional visual image, so called pixel or voxel of a visual image, the said visual image being formed by an array of the said pixels or voxels and utilities for indicating for each image data record a certain quality among a plurality of known qualities of the image data records; the system having a processing unit as for example a conventional computer, a memory in which an image pattern recognition algorithm is stored in the form of a software program which can be executed by the processing unit, a memory in which a certain number of predetermined different qualities which the image data records can assume has been stored and which qualities has to be univoquely associated to each of the image data records of an image data array fed to the system, input means for receiving arrays of digital image data records or input means for generating arrays of digital image data records from an existing image and a memory for storing the said digital image data array, output means for indicating for each image data record of the image data array a certain quality chosen by the processing unit in carrying out the image pattern recognition algorithm in the form of the said software program; the image pattern recognition algorithm is a prediction algorithm in the form of a software program, which prediction algorithm is further associated to a system being further provided with a training and testing software program, the system is able to carry out training and testing according to the method of one or more of the preceding claims 1 to 22, the

method is provided in the system in the form of the training and testing software program, a database being also provided in which data records are contained univoquely associating known image data records of known image data arrays with the corresponding known quality from a certain number of predetermined different qualities which the image data records can assume.

Lapointe teaches a specialized system for image pattern recognition having artificial intelligence utilities for analyzing a digitalized image (**Lapointe**, ¶0001 and ¶0148; 'Artificial intelligence' of applicant is equivalent to 'neural networks' of Lapointe.), i.e. an image in the form of a array of image data records, each image data record being related to a zone or point or unitary area or volume of a two or three dimensional visual image, so called pixel or voxel of a visual image (**Lapointe**, ¶0148; 'Pixel or voxel' of applicant is equivalent to 'Images are digitized' of Lapointe.), the said visual image being formed by an array of the said pixels or voxels and utilities for indicating for each image data record a certain quality among a plurality of known qualifies of the image data records (**Lapointe**, ¶0148; 'Array' of applicant is equivalent to 'fixed dimension' of Lapointe.); the system having a processing unit as for example a conventional computer, a memory in which an image pattern recognition algorithm is stored in the form of a software program which can be executed by the processing unit (**Lapointe**, ¶0006), a memory in which a certain number of predetermined different qualities which the image data records can assume has been stored and which qualities has to be univoquely associated to each of the image data records of an image data array fed to the system (**Lapointe**, ¶0006), input means for receiving arrays of digital image data

records or input means for generating arrays of digital image data records from an existing image and a memory for storing the said digital image data array (**Lapointe**, ¶0006), output means for indicating for each image data record of the image data array a certain quality chosen by the processing unit in carrying out the image pattern recognition algorithm in the form of the said software program (**Lapointe**, ¶0006); the image pattern recognition algorithm is a prediction algorithm in the form of a software program, which prediction algorithm is further associated to a system being further provided with a training and testing software program (**Lapointe**, ¶0066, ¶0010), the system is able to carry out training and testing according to the method of one or more of the preceding claims 1 to 22, the method is provided in the system in the form of the training and testing software program (**Lapointe**, ¶0010), a database being also provided in which data records are contained univoquely associating known image data records of known image data arrays with the corresponding known quality from a certain number of predetermined different qualities which the image data records can assume. (**Lapointe**, ¶0006, ¶0148) It would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to modify the teachings of Buscema, Feldgajer and Breed by employing the system for image pattern recognition as taught by Lapointe to have a specialized system for image pattern recognition having artificial intelligence utilities for analyzing a digitalized image, i.e. an image in the form of a array of image data records, each image data record being related to a zone or point or unitary area or volume of a two or three dimensional visual image, so called pixel or voxel of a visual image, the said visual image being formed by an array of the said

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pixels or voxels and utilities for indicating for each image data record a certain quality among a plurality of known qualities of the image data records; the system having a processing unit as for example a conventional computer, a memory in which an image pattern recognition algorithm is stored in the form of a software program which can be executed by the processing unit, a memory in which a certain number of predetermined different qualities which the image data records can assume has been stored and which qualities has to be univoquely associated to each of the image data records of an image data array fed to the system, input means for receiving arrays of digital image data records or input means for generating arrays of digital image data records from an existing image and a memory for storing the said digital image data array, output means for indicating for each image data record of the image data array a certain quality chosen by the processing unit in carrying out the image pattern recognition algorithm in the form of the said software program; the image pattern recognition algorithm is a prediction algorithm in the form of a software program, which prediction algorithm is further associated to a system being further provided with a training and testing software program, the system is able to carry out training and testing according to the method of one or more of the preceding claims 1 to 22, the method is provided in the system in the form of the training and testing software program, a database being also provided in which data records are contained univoquely associating known image data records of known image data arrays with the corresponding known quality from a certain number of predetermined different qualities which the image data records can assume.

For the purpose of using the invention to detect pathological conditions using images wherein the invention is based on neural networks trained using genetic algorithms.

Response to Arguments

6. Applicant's arguments filed on January 23, 2008 for claims 1, 3-35 have been fully considered but are not persuasive.

7. In reference to the Applicant's argument:

Claims 7, 10, 11 and 12 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner stated that the term 'preprocessing' was not described in the specification. The Examiner's attention is respectfully directed to the following paragraphs in the specification where the term 'preprocessing' is discussed: (1) paragraph 31, page 9; (2) paragraph 58, page 16, with reference to Figure 4; (3) paragraphs 103-104, pages 28-29, with reference to Figure 3; (4) paragraphs 107-108, pages 29-30; (5) paragraph 124, page 36; (6) paragraphs 150-151, page 49.

Examiner's response:

In light of the applicant's argument, the Examiner withdraws the rejection.

8. In reference to the Applicant's argument:

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Claims 1, 2, 9, 14-18, 30, 32, 33 and 35 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner stated that the term 'fitness score' was recited in the claims, without a description of how the fitness score is generated. The Examiner's attention is respectfully directed to the following paragraphs in the specification where the term 'fitness score' and methods for determining the fitness score are discussed: (1) paragraph 35, page 9; (2) paragraph 43, page 12; (3) paragraph 57, page 15; and (4) paragraph 87, page 23, with reference to Figure 2. As noted in paragraph 41, the present invention may be practiced by using an algorithm such as "GenD" to calculate a fitness score. The "GenD" algorithm was published in 2000 and is known to those skilled in the art. Paragraph 87 contains a definition of a fitness score: "the error in predicting the known output variables of the testing sets on the basis of the corresponding input variables of the testing set."

Examiner's response:

In light of the applicant's argument that the 'fitness score' is mentioned within the article 'Genetic Doping Algorithm', the Examiner withdraws the rejection.

9. In reference to the Applicant's argument:

Claims 2 and 33 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner stated that the term 'pseudorandom' was not described in the specification. (Claim 2 has been cancelled and the subject matter thereof incorporated into claim 1.) It is respectfully submitted that the term 'pseudorandom' is used in mathematics with a well-known meaning. It is well known that in practice the generation of a pure random number is not possible; some sort of deterministic process must be used to generate "random" numbers. A repetition of such a number with a certain cycle will occur in any case after a very large number of intermediate numbers have been generated. This condition is understood to be pseudo-random. As noted in the specification (paragraph 18, page 6), the term 'pseudo-random' is known to those skilled in the art. Claim 33 has been amended to explicitly state a brief definition of the term 'pseudorandom' in the claim, namely a distribution formed by a deterministic mathematical process. This definition also appears in amended claim 1.

Examiner's response:

The Examiner withdraws the rejection based on lack of written description, but continues the rejection based on 'relative term.' See 35 U.S.C. §112 rejection above. Office Action stands.

10. In reference to the Applicant's argument:

Claims 2, 6, 7, 10-13, 31 and 33 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. The Examiner stated that no algorithm, formula or method was described in the specification for "optimization". It is respectfully submitted that "optimization," as recited in originally-filed claim 1, refers to performance of the claimed method. As taught in the specification (see especially paragraphs 103-112, with reference to Figures 3 and 6), the method is used to generate a prediction algorithm to arrive at a best distribution of data records.

It is earnestly believed that all of the claims are in compliance with 35 U.S.C. § 112.

Examiner's response:

In light of the applicant's argument that the 'optimization' is mentioned within the article 'Genetic Doping Algorithm', the Examiner withdraws the rejection.

11. In reference to the Applicant's argument:

Buscema discloses that, given a certain artificial neural network and given a database of known cases comprising known input variables associated to known output variables, the records of that database are randomly distributed on a training data set and on a

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testing dataset. Buscema does not disclose that an optimization of the distribution of the data records on the training and on the testing dataset can be obtained by the steps disclosed in amended claim 1 or in claim 30.

In addition, Buscema does not disclose that an optimization of the distribution of the data records on the training and on the testing dataset can provide for an optimization of a trained artificial neural network (ANN), that is, a network able to operate on unknown cases and make predictions. In the present application, by contrast, different ANNs being better (or worse) in carrying out a prediction function can be obtained by taking the database of known cases and carrying out training and testing steps of the ANN several times, each time choosing a different distribution. The fitness score is defined as the ability of a trained ANN to calculate an output which is nearest to the known output by using the testing database.

In practice, by feeding to the ANN the input data of certain data records of known cases not used for the training of the database, it is possible to measure the ANN's predictive skill or precision, by comparing the output of the ANN generated using input variables of a known record with the corresponding known outputs.

Once a population of prediction algorithms has been developed, that population can be used for generating a new generation of ANN by means of a genetic algorithm. The genome of the different ANN are the distribution of the data records onto the training and testing set; each ANN derived from a different distribution has a correspondingly different fitness score. This score is used to generate the ANN of a succeeding (child) generation.

Examiner's response:

'Optimization of the distribution' is not mentioned within claims 1 or 30. It is mentioned in claims 11, 13 and 31. 'Optimization of the distribution' of applicant is equivalent to 'method using groups' of Feldgajer. (**Feldgajer**, C10:16-26) Buscema is not used as a reference to optimization of the distribution. Office action stands.

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12. In reference to the Applicant's argument:

Feldgajer is understood to suggest the use of genetic algorithms, not for generating the best training and testing database of an ANN, but in order to determine the best architecture of the ANN itself, particularly relating to the parameters influencing the training or learning step. According to Feldgajer, parameters to be varied and identified by means of genetic algorithm techniques are those which influence training response (in particular, training rate and momentum). Feldgajer is concerned with the dynamic manipulation of those parameters. Feldgajer does not disclose or suggest that an improvement in the performance of a predictive algorithm (such as an ANN) can be obtained by distribution of the data records of a database of known cases onto a training and onto a testing set. Furthermore, Feldgajer does not disclose that a database of known cases should be subdivided into a training and into a testing set.

Feldgajer might be considered to suggest use of a genetic algorithm in the preparation of an ANN. However, Feldgajer does not disclose or suggest generating a population of prediction algorithms and applying an evolutionary algorithm to that population, as recited in claims 1 and 30. Feldgajer is also not understood to suggest training a prediction algorithm (such as an ANN) with different training sets, as recited in the claims.

Examiner's response:

Applicant claims that 'Feldgajer does not disclose or suggest generating a population of prediction algorithms and applying an evolutionary algorithm to that population.' Fig. 4 of Feldgajer, illustrates 'modify population of individual neural networks.' A population of neural networks is equivalent to 'population of prediction algorithms.' Office Action stands.

13. In reference to the Applicant's argument:

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Dependent claims 10, 14, 21 and 22 were rejected under 35 U.S.C. § 103(a) as unpatentable over Buscema and Feldgajer in view of Lapointe et al. Lapointe et al. is understood to disclose a method in which a set of data is partitioned into training and testing files (paragraph 91), and training of neural networks using training partitions. Lapointe et al. does not mention generations of prediction algorithms (or generations of networks), and does not disclose or suggest an evolutionary algorithm or assigning a fitness score, as recited in claim 1. Lapointe et al. thus does not remedy the defects of Buscema and Feldgajer as references against the present invention, so that the dependent claims listed above would not have been obvious from Lapointe et al. or from a combination of the references.

Examiner's response:

Lapointe is not mentioned within claim 1. In claim 10, 'Optimizing a database' of applicant is achieved by the 'greedy algorithm' of Lapointe. (**Lapointe**, ¶0099) Claim 14 has numerous issues described. Lapointe invention is in regards to a woman's health. (**Lapointe**, ¶0019) 'Recombination' and 'mutation' of applicant is equivalent to 'genetic algorithms' of Lapointe. (**Lapointe**, ¶0013 (for 'differentiated manner') and ¶0137) Since applicant does not exclude the creation that is below a fitness value, this is equivalent to the contingency table of Lapointe. If the information is above a fitness level of applicant then it is on the contingency table of Lapointe. Below a given fitness value would be equivalent to 'vulnerability list.' (**Lapointe**, ¶0430) Since not all of the population is not involved with marriages then they (vulnerability list) 'defines' the number of possible marriages. (**Lapointe**, ¶0100) In claim 21, 'Initial random distribution' of applicant is equivalent to 'random sample' of Buscema. (**Buscema**, p2, C2:16-34) In claim 22, Buscema discloses different training and validation sets. Figure 4 illustrates both testing and validation have within them 'present/absent' categories. (**Buscema**, p2, C2:16-34, p4, Figure 4) Office Action stands.

14. In reference to the Applicant's argument:

Claims 15-17, indirectly dependent from claim 1, were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buscema and Feldgajer in view of Boden (U.S. Pat. No. 5,708,774). Claims 15-17 all directly depend from claim 14 and incorporate all of the features of claim 14. Claims 15-17 thus characterize the evolutionary algorithm as a genetic algorithm with certain evolutionary rules. One of these rules is that individuals having a fitness value lower or equal to the average health of the entire population are not excluded from the creation of new generations but are marked out and entered in a vulnerability list. Neither Buscema nor Feldgajer offers a disclosure of such an evolutionary rule. Boden is understood to disclose automated testing software including a "fitness function" for evaluating individual call sequences (col. 5, line 66, to col. 6, line 15). Boden teaches (col. 6, lines 8-15) that succeeding generations are chosen based on the fitness function, and states that "individuals of low fitness value may not be selected at all." Boden therefore does not teach or suggest that individuals having a fitness value lower or equal to the average health of the entire population are marked out and entered in a vulnerability list, as required by claims 15-17. Accordingly, none of the cited references, nor a combination thereof, suggests that individuals having a fitness value lower or equal to the average health of the entire population be not excluded from the creation of new generations but rather marked out and entered in a vulnerability list. Accordingly, claims 15-17 would not have been obvious from any of the cited references, or from a combination thereof.

Examiner's response:

'Average health value' of applicant is equivalent to 'relative fitness' of Boden. Per Boden individuals with a low fitness value may not be selected. Thus, 'Couples with both members that are below the relative fitness level will not be selected. (**Boden**, C6:6-15) If a parent is chosen to have a child then it is due to the fact it was a child which has a different fitness value than its parents. If it did not then there would be no improvement within the algorithm. (**Boden**, C6:6-15) "Low fitness value' are not chosen to have children. (**Boden**, C6:6-15) Office action stands.

15. In reference to the Applicant's argument:

Claims 18-20, dependent from claim 14 (and indirectly from claim 1), were rejected under 35 U.S.C. § 103(a) as being unpatentable over a combination of Buscema, Feldgajner and Lapointe et al., in view of Boden and Burke et al. ("A Genetic Algorithms Tutorial Tool for Numerical Function Optimisation"). Burke et al. is understood to provide a basic teaching regarding genetic algorithms. Burke et al. does not teach or suggest the above-noted limitations of claim 1 regarding using a distribution of database records associated with a selected prediction algorithm, as recited in claim 1. Furthermore, Burke et al. does not teach or suggest the above-noted limitations of claim 14 regarding generations marked out and placed on a vulnerability list. Accordingly, Burke et al. does not remedy the defects in Buscema, Feldgajner, Lapointe et al., and Boden as references against the invention defined in claims 18-20. Claims 18-20 therefore would not have been obvious from the cited references.

Examiner's response:

Burke is not mentioned within claims 1, 14, 19 or 20. In claim 18, Burke discloses 'not have common genes' of applicant is controlled by Burke's 'Incest laws 0-3'. (**Burke**, p29, C2:10-20) Office action stands.

16. In reference to the Applicant's argument:

Claims 26 and 28, dependent from claim 25 (and indirectly from claim 1), were rejected under 35 U.S.C. § 103(a) as being unpatentable over Buscema and Feldgajner in view of Rose (U.S. Patent Application Publication No. 2002/0178132). Claim 27, dependent from claim 25, was rejected under 35 U.S.C. § 103(a) as being unpatentable over Buscema and Feldgajner in view of Breed (U.S. Patent Application Publication No. 2003/0002690). Claim 29, dependent from claim 25, was rejected under 35 U.S.C. § 103(a) as being unpatentable over Buscema, Feldgajner and Breed in view of Lapointe et al. Rose is understood to disclose an adaptive signal recognition system using a

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iterative algorithm. Breed is understood to disclose a system employing sensors and transducers for determining the status of a person inside a vehicle. Neither of these references discloses or suggests a method including distribution of database records, an evolutionary algorithm, or using a distribution of database records associated with a selected prediction algorithm in supervised learning, as recited in claim 1. It follows that neither references discloses or suggests a system for carrying out this method, as recited in claim 25. Accordingly, neither Rose nor Breed remedies the above-noted defects of Buscema, Feldgajer and Lapointe et al. as references against the inventions defined in claims 26-29. Claims 26-29 therefore would not have been obvious from the cited references.

Examiner's response:

There is no mention within claims 26 or 28 regarding 'distribution of database records, an evolutionary algorithm, or using a distribution of database records associated with a selected prediction algorithm in supervised learning.' Rose is used in combination with Buscema and Feldgajer. Office action stands.

Examination Considerations

17. The claims and only the claims form the metes and bounds of the invention.

"Office personnel are to give the claims their broadest reasonable interpretation in light of the supporting disclosure. *In re Morris*, 127 F.3d 1048, 1054-55, 44USPQ2d 1023, 1027-28 (Fed. Cir. 1997). Limitations appearing in the specification but not recited in the claim are not read into the claim. *In re Prater*, 415 F.2d, 1393, 1404-05, 162 USPQ 541, 550-551 (CCPA 1969)" (MPEP p 2100-8, c 2, I 45-48; p 2100-9, c 1, I 1-4). The Examiner has the full latitude to interpret each claim in the broadest reasonable sense. Examiner will reference prior art using terminology familiar to one of ordinary skill in the

art. Such an approach is broad in concept and can be either explicit or implicit in meaning.

18. Examiner's Notes are provided to assist the applicant to better understand the nature of the prior art, application of such prior art and, as appropriate, to further indicate other prior art that maybe applied in other office actions. Such comments are entirely consistent with the intent and sprit of compact prosecution. However, and unless otherwise stated, the Examiner's Notes are not prior art but link to prior art that one of ordinary skill in the art would find inherently appropriate.

19. Examiner's Opinion: Paragraphs 17 and 18 apply. The Examiner has full latitude to interpret each claim in the broadest reasonable sense.

Conclusion

20. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

21. Claims 1, 3-35 are rejected.

Correspondence Information

22. Any inquiry concerning this information or related to the subject disclosure should be directed to the Examiner Peter Coughlan, whose telephone number is (571) 272-5990. The Examiner can be reached on Monday through Friday from 7:15 a.m. to 3:45 p.m.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor David Vincent can be reached at (571) 272-3080. Any response to this office action should be mailed to:

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/P. C./

Examiner, Art Unit 2129
Peter Coughlan
3/20/2008

/Joseph P. Hirl/
Primary Examiner, Art Unit 2129